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Research Note (Subject – Palynology)



Paleoecology of Panandhro Lignites, Gujarat, India

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Abstract

The present paper records palynofossils from the Panandhro lignite succession of Gujarat, India. Six genera belong to pteridophytes, two genera belong to gymnosperms and remaining genera belong to angiosperms, along with fungal remains and foraminiferal linings. Ecological analysis of the palynofossil assemblage shows the freshwater swamp and water edge, forest, low lands, montane and mangrove group elements. Overall, the assemblage suggests that the prevalence of brackish to freshwater swamp vegetation during the deposition of the Panandhro lignites.

Keywords: Palynology, Lignite, Panandhro, Gujarat, India.

Introduction

This paper documents the palynological composition of a lignite succession in the Panandhro mine, Gujarat, India and presents its paleoecology. The Panandhro lignite belongs to the Naredi Formation which is dominantly argillaceous and directly overlies the Deccan Trap in the studied area. The organic facies comprises lignite and carbonaceous shales and mainly occurs in small isolated -and partially closed- basin like structures created by post-Deccan Trap topography (Biswas, 1992). The location map and studied lithologic section has been shown in Figure 1.

Material & Methods

Fifteen samples of lignites succession were collected from a working section of the Panandhro

mine, Northwestern Kutch, Gujarat, India. The sampling interval ranged from 0.3 to 0.8 meters depending on the thickness of the lignite and carbonaceous shale. Number of samples was comparatively more in thicker lithological units. For palynological purposes a total of 15 samples were processed in several steps according to standard methods (Traverse, 1988). Accordingly, samples were treated with HCl to remove carbonates, HF to remove silicates, Schulze's solution for oxidation, and KOH to remove humic substances. Then swirling was carried out to separate organic matter and palynofossils from heavier mineral / inorganic matter. Sieving was carried out on 8-10 micrometer mesh nylon cloth for removal of finer organic and inorganic particles. Organic matter was centrifuged and the slides were prepared adding polyvinyl alcohol and mounted in canada balsam and slides

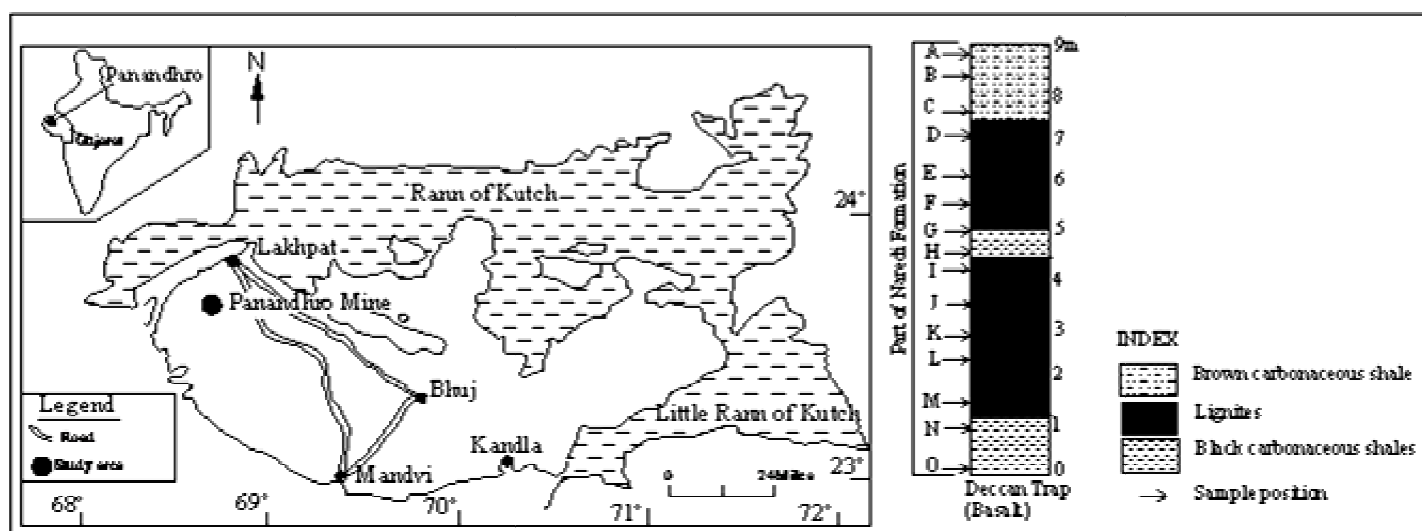


Fig. 1. Location of Panandhro lignite mine and studied lithologic section from the mine.

were labeled. Some samples were ill preserved and in some samples recovery was poor (sample numbers D, E, J).

Results & Discussion

The palynological assemblage represented in this succession comprises 32 genera pollen and spores

among which are 6 genera of pteridophytes, 2 genera of gymnosperms, and 24 genera of angiosperms, along with foraminiferal linings and fungal remains as given below. Selected photographs from the studied samples are shown in Figure 2.

Genus	Plant Groups	Genus	Plant Groups
<i>Laevigatosporites</i>	Pteridophytes	<i>Retitricolpites</i>	Angiosperm
<i>Polypodiisporites</i>	Pteridophytes	<i>Cupuliferoidaepollenites</i>	Angiosperm
<i>Cicatricosisporites</i>	Pteridophytes	<i>Margocolporites</i>	Angiosperm
<i>Schizaeoisporites</i>	Pteridophytes	<i>Rhoipites</i>	Angiosperm
<i>Polypodiaceisporites</i>	Pteridophytes	<i>Tricolporites</i>	Angiosperm
<i>Cyathidites</i>	Pteridophytes	<i>Tiliapollenites</i>	Angiosperm
<i>Pinuspollenites</i>	Gymnosperm	<i>Psilodiporites</i>	Angiosperm
<i>Inaperturate pollen</i>	Gymnosperm	<i>Dicolpopollis</i>	Angiosperm
<i>Echimonocolpites</i>	Angiosperm	<i>Monosulcites</i>	Angiosperm
<i>Liliacidites</i>	Angiosperm	<i>Palmidites</i>	Angiosperm
<i>Proxapertites</i>	Angiosperm	<i>Pseudonothofagidites</i>	Angiosperm
<i>Longapertites</i>	Angiosperm	<i>Couperipollis</i>	Angiosperm
<i>Spinizonocolpites</i>	Angiosperm	<i>Palmaepollenites</i>	Angiosperm
<i>Proteacidites</i>	Angiosperm	<i>Iugopollis</i>	Angiosperm
<i>Triorites</i>	Angiosperm	<i>Engelhrdtiodites</i>	Angiosperm
<i>Tricolpites</i>	Angiosperm	<i>Tricolporopollenites</i>	Angiosperm

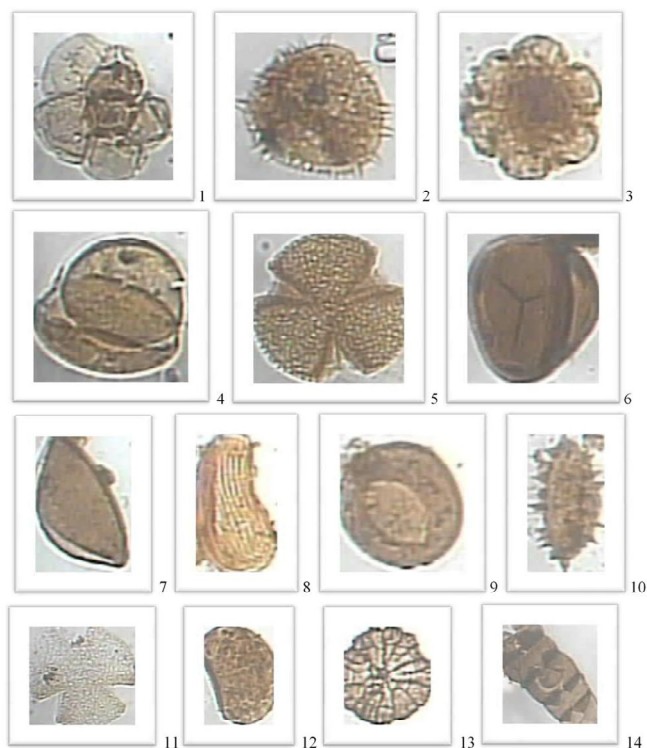


Fig. 2. Some selected palynofossils from studied samples (All photo X 300): 1 Foraminiferal linings. 2. *Spinizonocolpites baculatus* Muller, 1968. 3. *Pseudonothofagidites* sp. 4. *Proxapertites* sp. 5. *Margocolporites* sp. 6. *Cyathidites* sp. 7. *Longapertites* sp. 8. *Schizaeoisporites* sp. 9. *Palmaepollenites ovatus* Potonie, 1951. 10. *Couperipollis achinatus* Venkatachala and Kar, 1969. 11. *Retitricolpites* sp. 12. *Polypodiisporites* sp. 13. Fungal remains. 14. Fungal remains.

Palaeoecology

The botanical affinities of palynofossils were determined to investigate ecological conditions at the time of deposition these lignites. The palynofossils of the Panandhro lignite succession can be grouped into the following ecological members.

Freshwater swamp and water edge members	
<i>Laevigatosporites</i>	Polypodiaceae
<i>Polypodiisporites</i>	Polypodiaceae
<i>Cicatricosisporites</i>	Schizaeaceae
<i>Schizaeoisporites</i>	Schizaeaceae
<i>Polypodiaceoisporites</i>	Polypodiaceae
<i>Cyathidites</i>	Cyatheaceae

Forest members	
<i>Longapertites</i>	Arecaceae
<i>Palmaepollenites</i>	Arecaceae
<i>Iugopollis</i>	Sapotaceae
<i>Margocolporites</i>	Caesalpiaceae
<i>Palmidites</i> sp.	Arecaceae
Low Land members	
<i>Tricolpites</i>	Gunneraceae
<i>Rhoipites</i>	Anacardiaceae
Montane members	
<i>Pinuspollenites</i>	Pinaceae
<i>Proteacidites</i>	Proteaceae
Mangrove members (Brackish water)	
<i>Spinizonocolpites</i>	Arecaceae (Nypa)

The presence of mangrove members suggest brackish depositional environment for the lower carbonaceous shale and the middle carbonaceous shale (Traverse, 1988; Samant, and Tapaswi, 2001). The presence of foraminiferal linings further corroborates it (Traverse, 1988). The lignites and brown carbonaceous shale contains fresh water palynofossils and absence of *Spinizonocolpites* and Foraminiferal linings suggest freshwater depositional environment (Traverse, 1988). The presence of montane members suggests some elevated regions around the depositional sites (Samant, and Tapaswi, 2001). A generalized reconstruction of paleoecology of Panandhro is given in Figure 3.

Conclusions

Palynofossil analysis shows the freshwater swamp and water edge, forest, low lands, and mangrove group elements. Overall, the palynofossil assemblage suggests that the prevalence of brackish to freshwater swamp vegetation during the deposition of the Panandhro lignites. Angiosperms affiliated plants and vegetations contributed predominantly in the formation of Panandhro lignites.

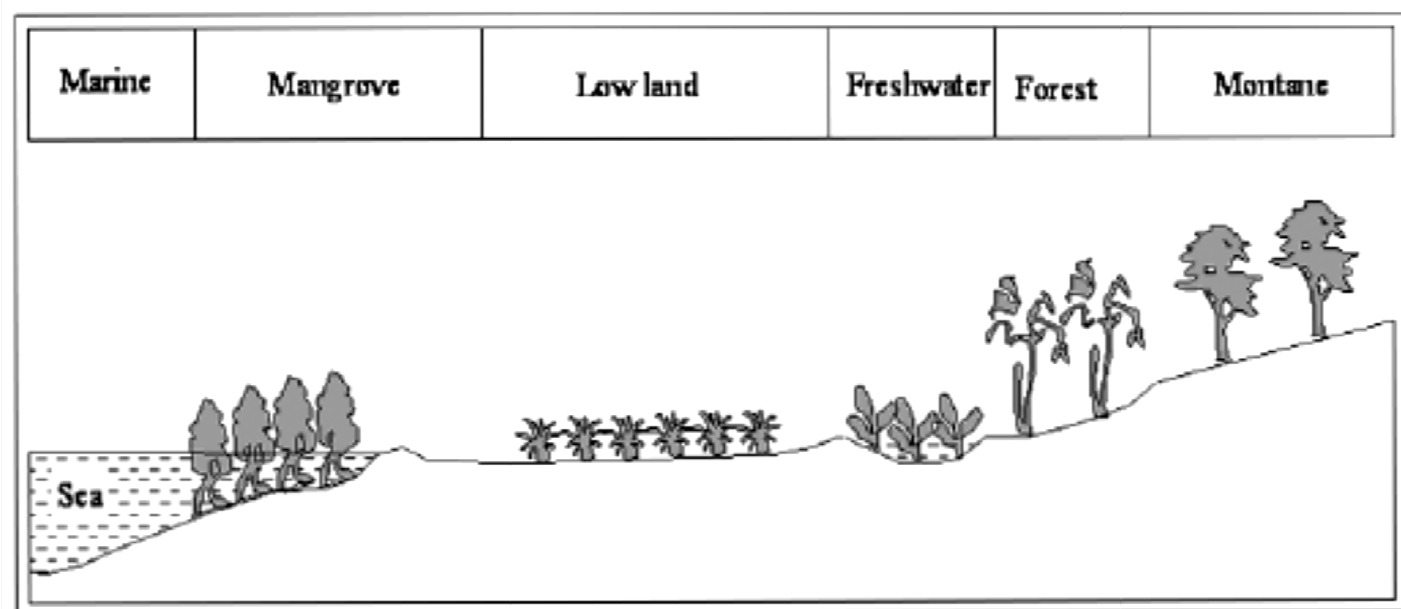


Fig. 3. A generalized reconstruction of ecology prevailing in Panandhro during deposition of lignites.

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